Tone and Cyclicity in Tokyo Japanese

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References

The phenomenon of stress and tone appear to be two very distinct processes in many languages of the world. The rules of tone systems are local, like most segmental rules; with ordered rules of insertion and deletion of tones or association lines occurring in narrowly limited contexts. Metrical stress systems, on the other hand, employ processes that are unbounded and hierarchical in that they apply to the entirety of the string, and require several levels of organization. One would expect that particular languages would be clear expressions of one or the other of these two very different styles of organizing information, and this is usually the case. Japanese, however, is a language that can be approached from either angle.

The intricacies of the Japanese tone system have been discussed by many authors (among them Haraguchi (1977) and Archangeli and Pulleyblank (1983)) and subjected to a variety of analyses. In this paper the tonal properties of Tokyo Japanese are explained as the expression of metrical processes, using the notation and approach of Halle and Vergnaud (1985). The Halle and Vergnaud notion of cyclicity as entailing the construction of a new stress plane that obliterates some pre-existing information, is shown to be necessary for an account of Tokyo Japanese. Section 2 of the paper is an outline of the tonal system and its metrical organization. Section 3 is a tour of Japanese morphology, concentrating on the predicate morphology, and leading to the conclusion that the distribution of cyclic and non-cyclic morphemes is not random, but highly organized. Finally in section 4, the metrical analysis is compared with the strictly tonal analysis of Archangeli and Pulleyblank, and shown to be superior in scope and simplicity. The data on nominal clitics is drawn from Achangeli and Pulleyblank. The data on predicate affixes comes from two sources: Jorden Beginning Japanese(1972) and Akinaga in Nihongo Hatsuon Akusento Jiten(1966). The judgements of a native speaker of Tokyo Japanese are also referred to for one set of examples.

1. PRELIMINARIES

1.1 Post-lexical Tone Assignment

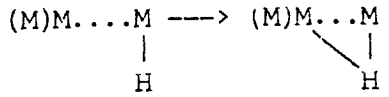
The part of the Japanese stress and tone system that is relevant to morphology does not include certain late tonal processes. Morphological processes are viewed here as acting upon the distribution of stress diacritics, represented by asterisks. Some tonal effects that derive the surface form from the morphological output are assumed to be post-lexical, and will not be discussed in the analyses presented in this paper.[1] These are the tonal effects produced by the rules below. They apply to all domains: nominal, verbal and adjectival. The post-lexical tone rules employed here are modeled after those of Archangeli and Pulleyblank (1983), but any failings of the rules are the fault of the author's.

---

1. Pierrehumbert and Beckman (1986) have suggested that these tonal phenomena are in fact phonetic rather than phonological.

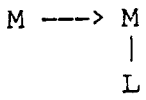
1)

i) High Tone Spread, with extratonality of first mora.



A linked high tone is spread toward the front of the word, up to but not onto the first mora.

ii) Default Low Insertion

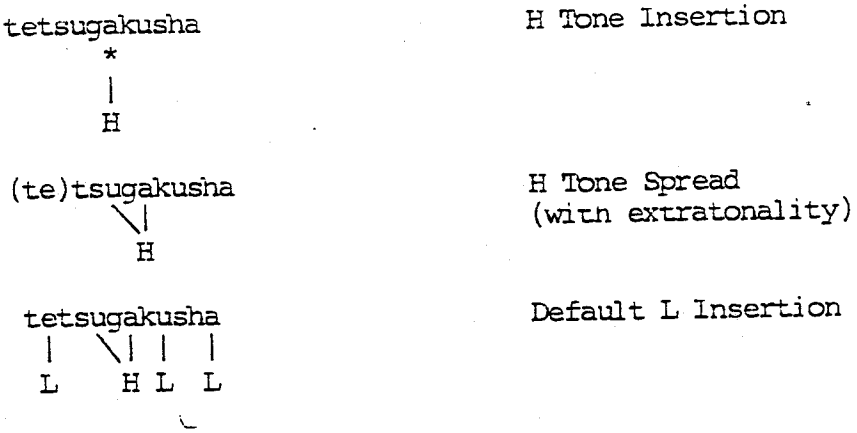


Any unlinked mora is linked to a low tone.

Stems or words may be accented or unaccented. Accented words have their accents marked with an asterisk under the appropriate mora. An accented word receives a high tone on the accented mora. The post-lexical tone rules then act upon the word to spread the tone up to but not onto the first mora, and supply the first mora with a default low tone. This means that a word that comes out of the morphology bearing an accent surfaces with a string of high tones running from the second mora to the underlyingly accented mora, as in "tetsugakusha" (philosopher). If the word is accented on the first mora, the final output will be accented on the first and only the first mora, as in "tekishaseizon" (survival of the fittest).

Post-lexical tone in accented words

2) tetsugakusha "philosopher"
*



3) tekishaseizon "survival of
* the fittest"

tekishaseizon — H Tone Insertion
*
|
H

tekishaseizon — H Tone Spread
| (not applicable)
H

tekishaseizon — Default L Insertion
| | | | |
H L L L L

Post-lexical tone in unaccented words

Unaccented stems, represented as bearing no accent diacritic, surface with a high tone on the last mora. High tone spreading and default low insertion then apply just as with the accented words. The word "tetsugakuteki" (philosophically) illustrates this.

Post-lexical tone in unaccented words

4) tetsugakuteki "philosophically"

tetsugakuteki — H Tone Insertion
|
H

(te)tsugakuteki — H Tone Spread
\\\| (with extratonality)
H

tetsugakuteki — Default L Insertion
| \\\|
L H

Many of the examples in this paper are shown without these late effects; that is, before the application of High Tone Spread and Default Low Insertion.

2. A Metrical Account of Japanese Tone

2.1 Overview of Halle and Vergnaud

Halle and Vergnaud (1985) employ a notation for capturing the metrical nature of stress rules that is based upon the grid. This section will provide a brief outline of how the notation is used. For a more detailed exposition and motivation of the system, the reader is referred to the paper by Halle and Vergnaud.

The levels of hierarchy in metrical stress assignment are represented as lines of asterisks, one above the other. Line Ø, the bottom line, represents all and only those elements that participate in stress processes. These may be vowels, syllables, or morae. Line Ø contains one asterisk placed above each of these basic elements in the string. For example:

5)

```
line Ø        * * * * *
            representation
```

Each line represents a degree of stress. In the usual case, line 1 represents secondary stress, and line 2 main stress. Each line of asterisks is constructed with reference only to those on the line below, or in some cases, to those several lines below. Constituents are constructed on each line, and the heads of the constituents on one line become the asterisk-building-blocks on the line above. Constituents on each line may be right-headed or left-headed; binary or unbounded. Binary constituents have the additional parameter of being constructed from left-to-right or right-to-left. In the example below, line Ø constituents are binary, left-to-right, and right-headed. Line 1 constituents are unbounded and left-headed. Main stress falls on the second syllable, and secondary stress on alternating syllables counting to the right from the main stress.

6)

```
line 2      *
line 1   (  *      *      *      *    *)
line Ø   (* *) (* *) (* *) (* *) (*)
```

Lexically marked stresses are inherently marked with an asterisk on line 1. Constituents constructed on line Ø must respect these pre-marked heads. In this example, the third and fifth syllables of the string have lexically marked stress:

7)

```
line 1        *   *
line Ø    * * * * * *
              ^   ^
```

In the same example, right-headed unbounded constituents are constructed on line Ø as follows:

8)

```
line 1          *     *  *
line Ø    (* * *)(* *)(*)
               ^     ^
```

Languages that have a main stress derivable by metrical rules but are without any secondary stress reflecting the application of these rules, may have their line 1 secondary stress suppressed by tier conflation. Only those asterisks on line 1 that also have heads on line 2 are preserved when tier conflation takes place:

9)

```
line 2                  *                                  *
line 1    (*    *       *  )   ----->    (               *  )
line Ø    (* *)(* * *)(* *)   tier          * *  * * *  (* *)
                              conflation
```

Finally, Halle and Vergnaud propose a view of cyclicity that interacts with the stress grid. They propose that the cyclic morphology obliterates existing information in a way that the non-cyclic morphology does not. This is represented in the theory by the introduction of a new stress plane (over which the grid is contructed) by the cyclic morphology. While the cyclic morphology introduces a new plane, the non-cyclic morphology makes use of the pre-existing stress plane. In the usual case information on the old stress plane is not transmitted to the new one. Consequently, some information is obliterated when a cyclic morpheme is affixed to a word. The interaction of the stress rules that construct a grid with the affixation of cyclic and non-cyclic morphemes yields the complicated stress patterns of languages like Vedic Sanskrit and Russian. In the rest of section 2 and in section 3, Japanese is shown to belong to this class of languages.

2.2 The General Stress Rule in Japanese

Stress and accent in Japanese is expressed as a high tone on the accented mora. Underlyingly accented words surface with a high tone on the accented mora, while unaccented words aquire a high tone on the final mora. This means that every tonal domain (for general purposes this means every word: adjective, verb or noun) must have one and only one high tone associated with it. It is a property of metrical systems, that one prominent element is selected in each word for phonetic or acoustic emphasis. A general stress rule is operative in Japanese, to derive this distinction between accented and unaccented words:

1Ø)

i) Construct unbounded right-headed constituents on line Ø
ii) Construct an unbounded left-headed constituents on line 1
iii) Conflate tiers

The effect of this rule is to select the leftmost diacritic, and if there is none, the rightmost mora of the domain. In the case of the accented noun "kokoro" ('spirit') and the unaccented noun "sakana" ('fish'), the rules i)

and ii) build the grids below:

11)

```
line 2          *                       *
line 1      (   *  *)              (      *)
line Ø      (*  *)(*)              (*  *  *)
            ko ko ro                sa ka na
               ^
```

The mark ^ under the word signifies the lexically marked accent of "kokoro". The marked mora automatically receives an asterisk on line 1, since it is the head of a constituent. Rule (i) builds right-headed feet on line Ø, entering the rightmost asterisks of the line Ø constituents on line 1. Rule (ii) picks out the leftmost asterisks on line 1 to be the head of the word tree (i.e., main stress). Then, rule (iii) conflates the tiers so that secondary stresses are not represented in the grid.

High Tone Insertion occurs late in the derivation, after the metrical machinery has located main stress, and before the post-lexical phenomena of high tone spreading and low insertion.

2.3 The General Stress Rule and Recessive Suffixes

2.3.1 Predicate morphology

When we turn our attention to the interaction of the General Stress Rule with verbal and adjectival stems, we must consider the morphology of the Japanese predicate system, since these stems rarely, if ever, occur in isolation. There are three classes of suffixes, distinguished by how they behave with regard to stress. Recessive suffixes do not affect the accent on the stem or its manifestation as high tone. Dominant-accented suffixes and dominant-shifting suffixes cause the underlying accent on the stem to be overridden by the suffix, (making it invisible to High Tone Insertion), in ways that are discussed in section 2.4. All three types of suffixes occur in the predicate morphology, but in the nominal system, suffixes (clitics) are only recessive or dominant-accented.

The past morpheme "ta" is one of a large class of recessive suffixes that attach to predicate stems. If it is affixed onto an accented stem, the location of the diacritic is not affected:

12)

```
aruk  ta   "walk", past
  *

aruita                      suffixation of "ta"
  *                         segmental changes

aruita                      H Tone Insertion
```

```
  *
  |
  H

aruita                          H Tone Spread
| || |                         Default low insertion
L HL L
```

13)

```
tabe  ta   "eat", past
 *

tabeta                          suffixation of "ta"
 *


tabeta                          H Tone Insertion
 *
 |
 H

tabeta                          H Tone Spread
 | | |                         Default low insertion
 H L L
```

If "ta" is affixed onto an unaccented stem, the word surfaces with the high tone on the final mora, just as in the case of the unaccented noun "sakana" (section 2.2):

14)

```
ire  ta      "put" + past

ireta              suffixation of "ta"


ireta              High Tone Insertion
    |
    H

ireta              High Tone Spread
| \|              Default Low Insertion
L  H
```

The General Stress Rule applied to the forms "tabeta", "aruita" and "ireta" constructs the grids below:

15)

```
line 2      *                *                *
line 1    (*     *)      (   *    *)      (      *)
line Ø    (*)(*  *)      (*  *)(* *)      (*  *  *)
          ta be ta         a ru i ta         i re ta
          ^                  ^
```

Again, accented mora are automatically marked as heads on line 1. Rule (i) builds right-headed constituents on line Ø, respecting the lexically marked heads. Then rule (ii) builds left-headed constituents on line 1, selecting leftmost members of the constituents as heads. The grid in (15) is represented before tier conflation. Rule (iii) applies to the grid to conflate the tiers and suppress the secondary stress information represented on line 1.

Note that the General Stress Rule does not apply to these stems before inflection. Such an application of the rule to the form "ireta" would generate the incorrect form

```
ireta
  *
```

with the accent on the second mora, by deriving

```
ire
  *
```

on the first cycle, and

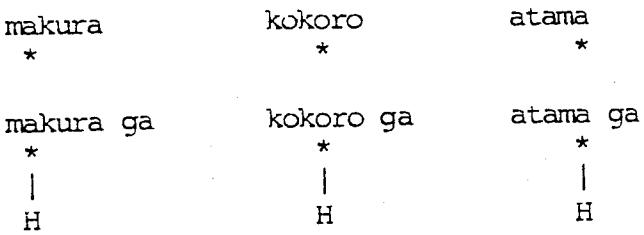
```
ireta
  *
```

on the second cycle. These recessive suffixes are non-cyclic suffixes. Non-cyclic affixes are characterized by two things: (1) They do not obliterate any accentual information on the stem, and (2) rules that apply to them apply only once, at the end of the derivation (rather than re-applying upon each instance of suffixation as with the cyclic suffixes.) Examples (12) and (13) illustrate the first characteristic and (14) illustrates the second.

2.3.2 Nominal clitics

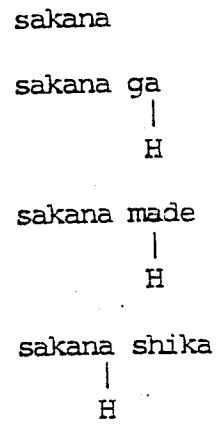
The noun clitcs "ga" (nominal case marker), "made" ('until') and "shika" ('only') fall into the class of recessive suffixes, and undergo the General Stress Rule. The nouns "makura" ('pillow'), "kokoro" ('spirit'), and "atama" ('head') are accented on the first, second and third morae respectively. The high tone surfaces on the underlyingly accented mora when one of these clitics follows the noun. The clitics do not shift accent. (The examples to follow are not derivations. The linked H indicates where the high tone surfaces in the final output.)

16)



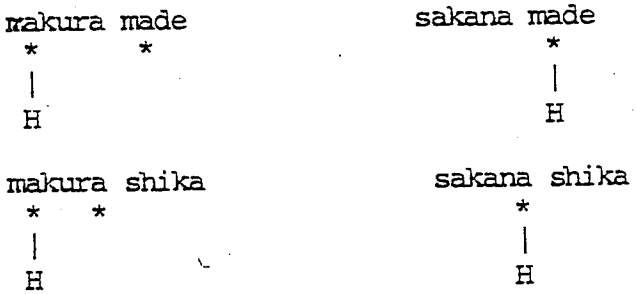
When these clitics follow unaccented stems the situation is slightly different from that of the predicate suffixes discussed in section 2.3.1. High tone is assigned to the final, penultimate, or antepenultimate mora, depending on the clitic. (With predicate suffixes of section 2.3.1, the high tone may only appear on the final mora.) "Sakana" ('fish') is an unaccented noun:

17)



Suffixation of "ga" results in the high tone being placed on the final mora; suffixation of "made" places it on the penultimate mora; and with "shika", the high tone falls on the antepenultimate mora. A simple explanation is available: "Made" is an accented recessive suffix, and "shika" a pre-accented recessive suffix:

18)



Since these are non-cyclic suffixes, the General Stress Rule applies only once to these noun-clitic combinations, picking out the leftmost accent where there is one, and the rightmost edge where there is none. (Since these suffixes supply accents to the domain, there is no instance of default selection of the rightmost mora in unaccented domains.) The stress patterns of "makura made" and "sakana made" are derived below:

19)

```
   *                              *
  (*       *  *)                (       *  *)
  (*)(* *  *)(*)                (* * *  *)(*)
   makura made                   sakana made
    ^     ^                       ^
```

2.3.3 Two interesting classes of recessive predicate suffixes

a. Adjectival allomorphs

Most of the recessive suffixes of the predicate morphology aquire a high tone on the final mora in unaccented domains. There are two classes of exceptions to this generalization, however. The first are the adjectival allomorphs of the verbal suffixes indicating tentative, past, pre-provisional and gerund. Allomorphy rules spell out these morphemes upon affixation. In all of these cases the sequence kV(C) is added to the morpheme after an adjective stem:

20) Allomorphy rules

verbal form		adjectival form	
yoo	--->	karoo / Adj__	tentative
ta	--->	katta / Adj__	past
re	--->	kere / Adj__	pre-provisional
te	--->	kute / Adj__	gerund

Not only is a segment added, but in all forms but the tentative, a pre-accent is associated with the adjectival form. These suffixes are recessive, for when they are affixed to accented stems, no change in accent results:

21)

```
atsu          stem: "is hot"
*

atsukatta     past:  "was hot"
*  *
```

```
|
H

atsukereba    tentative: "if __ hot"
*  *
|
H

atsukute      gerund: "being hot"
*  *
|
H
```

When these suffixes are affixed to unaccented stems the high tone occurs on the last mora before the suffix:

22)

```
atsu          stem: "is thick"

atsukatta     past:  "was thick"
   *
   |
   H

atsukereba    tentative: "if __ thick"
   *
   |
   H

atsukute      gerund: "being thick"
   *
   |
   H
```

These are pre-accenting suffixes, like the nominal clitics of section 2.3.2. They introduce an accent to the domain, and the General Stress Rule selects the leftmost accent as the prominant one of the domain.

b. Complementizers

A second group of recessive predicate suffixes is an exception to the rule that high tone always surfaces on the final mora in unaccented domains. These are the three endings "ta.ra" (conditional), "ta.ri" (representative) and "re.ba" (provisional). With accented stems, the high tone falls on the underlying accent:

23)

```
tabe        stem: "eat"
 *
```

tabetara conditional: "if __ were to eat..."
 *
 |
 H

tabetari representative: "eating and so on"
 *
 |
 H

tabereba provisional:"if __ eat" [2]
 *
 |
 H

With unaccented stems, the high tone falls on the penultimate mora:

24)
ire stem: "put"

iretara conditional: "if __ were to put..."
 |
 H

iretari representative: "putting and so on"
 |
 H

irereba provisional: "if __ put"
 |
 H

If we consider the syntax and semantics of these three forms, we discover a unifying characteristic of the class: they all occur at the end of a subordinate clause, and they all carry out a complementizer-like function. In fact, I suggest that "ra", "ri" and "ba" are in COMP rather than INFL position, and this accounts for the fact that they do not receive final high tone. "Ra", "ri", and "ba" are extratonal by virture of being in COMP position, where they are invisible to the General Stress Rule. The rule respects a COMP-INFL boundary, even though on the surface, the complementizer seems to have been absorbed into the inflection proper.

Let us look more closely at the syntax of these inflections. Of the inflectional endings discussed in this paper (see section 3), only [...te, ...ku, zu, ...ta.ra, ...ta.ri, and ...re.ba] can end an adjunct or subordinate clause. (Relative clauses are a separate matter.) It can be argued that a clause ending in "...ku" has a deleted gerund ending: "...ku

---

2. See footnote 5 regarding "re".

(te)" and one ending in "...zu" has a deleted particle "ni": "....zu (ni)".

25)

[gohan o tabezu (ni)] dekaketa
meal OBJ eat-neg-adv (prep) go out -past
"(He) went out without eating."

26)

[gohan o tabetaku (te)] dekakenakatta
meal OBJ eat-vol-adv (ger) go out -neg-past
"Wanting to eat, (he) didn't go out."

Thus only "-te", "-ta.ra", "-ta.ri", and "-re.ba" are truly clause-final. Clauses ending in "ta.ra", "ta.ri" or "-re.ba" are clearly adjunct clauses, while clauses ending in "-te" have a status closer to coordinate clauses.

27)

[kutsushita ga nakattara] katte kudasai
socks SUB is not-past-cond buy please
"If (you) don't have socks please buy (some)."

28)

itsumo [kutsu o nakushitari] [kutsushita o wasuretari] shite imasu
always shoes OBJ lose-past-rep socks OBJ forget-past-rep is doing
"(He) is always doing things like losing (his) shoes and
forgetting (his) socks."

29)

[okane ga nakareba] kutsushita o kaimasen
money SUBJ is not-prov socks OBJ buy-nonpast-formal-neg
"If (I) don't have money (I) won't buy socks."

3Ø)

[kutsushita o katte] [toshookan e ikimashita]
socks OBJ buy-ger library to go-formal-past
"(She) bought socks and went to the library."

Therefore, "ta.ra", "ta.ri" and "re.ba" are exactly those endings that are truly clause-final, and serve as complementizers in relating a subordinate clause to a main clause. Japanese, a verb-final language, is also COMP-final. This means that in adjunct or embedded clauses, the COMP will follow the verbal inflection at the end of the clause:

[Case-marked NP's...Verb-INFL-COMP]

The conditional ending "-ra", the representative "-ri" and the provisional "-ba" are in a sense, external to the morphology. They are in COMP rather than INFL, and so are effectively extratonal. They are added after the morphology proper.[3] An accented and an unaccented verb with the affix "ta.ra" are derived below.

31) accented

tabe ta ra *	"if __ eat"
tabeta ra *	affixation of "ta"
tabeta ra * | H	General Stress Rule High Tone Insertion
tabetara | H	affixation of "ra" in syntax
tabetara | | | | H L L L	High Spread Rule n/a Default Low Insertion

32) unaccented

ire ta ra	"if __ put"
ireta ra	affixation of "ta"
ireta ra | H	General Stress Rule High Tone Insertion

---

3. The endings "ra", "ri" and "ba" could be analyzed as pre-accented rather than extratonal. The two approaches yield no empirical differences in this case. It is the complementizer-like quality of these endings that argues for their being outside of the domain of strict morphology, and therefore extratonal.

```
iretara          affixation of "ra" in syntax
    |
    H

iretara          High Tone Spreading,
| \| |           Default Low Insertion
L  H L
```

2.4 Assignment of Stress in Accented Verbs

Some of the metrical characteristics of this system are apparent in the operation of the General Stress Rule, which applies across the board to verbal, adjectival and nominal forms. However, metrical properties are even more pronounced in the narrower realm of the distribution of underlying stress in accented verbs. Accented verb stems have a regular pattern of accentuation. Accented verbs ending in consonants have their accents on the last mora of the stem, while those ending in vowels have their accents on the first mora.[4] (In the examples below, separate morae are indicated by dots.)

33)

vowel-final	consonant-final
si.n.ji.- "believe"	yo.ro.kob.- "rejoice"
*	*

Accented stems are distinguished from unaccented stems by being associated underlyingly with a diacritic. With verb stems this is a floating diacritic which is then linked with the stem as follows:

---

4. There are exceptions to this generalization of stress location in accented verb stems. In Jordan and Akinaga, 34 verb forms are listed with both recessive and dominant suffixes. (This is necessary to determine location of stress on the stem.) Of these, nineteen are accented verbs, and of the nineteen, two forms do not fit the pattrern described here:

ka.er (to return) * and shi.ra.ber (to look up) *

I believe that this is a generalization sufficiently broad to be worthy of explanation. The exceptions may reflect a growing lexicalization of these forms. Perhaps the language is moving away from the metrical assignment of stress in accented stems.

34)
i) Link floating diacritic to the last closed syllable
ii) Link floating diacritic to the first syllable

This is a familiar pattern from metrical stress systems: accent the last heavy syllable, or the first syllable. Prince (1983) (with rererence to Hayes {1981}), mentions several languages showing this pattern: Classical Arabic, Eastern Cheremis, Chuvash, Hindi, Huasteco, and Dongolese Nubian. The pattern is generated straightforwardly through a Halle and Vergnaud-style grid analysis, with the following rules:

35)
i) Assign line 1 asterisks to closed syllables
ii) Construct left-headed unbounded constituents on line Ø
iii) Construct a right-headed unbounded constituent on line 1
iv) Conflate

The rules operate on our two examples as below:

36)

```
line 2      *                    *
line 1     (*     )            (*     *)
line Ø     (* *  *)            (*  *)(*)
           si.n.ji             yo.ro.kob
                                    ^
```

All tone-bearing morae are marked on line Ø. Rule (i) places a line 1 asterisk above "kob". The remaining line 1 asterisks are placed by rule (ii), which, when it creates left-headed constituents, picks out heads of those constituents. Rule (iii) then selects the rightmost asterisk of line 1 to be the head of the constituent formed on that line. Main stress is correctly generated. Finally, rule (iv) applies to conflate the levels so that subsidiary stresses are not preserved.

These rules correctly distribute stress in accented verb stems. However, they do not apply to accented nouns, which may have their accents on any mora, and which do not have closed syllables ending in any consonant besides "n".

37)

```
makura      'pillow'
 *

kokoro      'spirit'
   *

atama       'head'
    *
```

Rules 35(i-iv) of stress assignment apply in a restricted domain of the language: verbal stems only. Phonological rules that apply only to a particular subset of forms are attested in other languages. This system shows us that metrical stress rules may be so lexically marked.

2.5. Cyclic Suffixes

2.5.1 Dominant-accented Suffixes

The General Stress Rule applies straightforwardly to forms with no suffixes, or to forms with recessive suffixes. There are two other classes of suffixes that interact with stress in particular ways. The dominant-accented suffixes neutralize the contrast between accented and unaccented stems, and the dominant-shifting suffixes erase the contrast between first- and last-mora-accented verb stems. In both cases, accentual information associated with the stem is obliterated by affixation of a dominant suffix. This is the crucial difference between dominant and recessive suffixes. Following Halle and Vergnaud (1986), recessive morphemes are non-cyclic, and dominant morphemes are cyclic. When cyclic suffixes are affixed to a stem, new autosegmental stress planes are constructed. Information carried on the stress plane of the stem is then rendered inaccessible to the General Stress Rule at the point in the derivation where it applies. Accentual information on the stem is neutralized in this way when an dominant-accented suffix is attached to a stem.

The data provide no evidence of cyclicity in the sense that rules must apply each time a suffix is attached. This Japanese data apparently does not distinguish between the General Stress Rule applying each time a suffix is attached, or applying once at the end of the cyclic morphology. The cyclic nature of these suffixes is determined solely by their ability to override information on the stem.

a. Predicate morphology

There is one dominant-accented suffix of the predicate morphology. This is the tentative morpheme "yoo/karoo". Both accented and unaccented stems ending in "yoo/karoo" surface with the final high tone on the penultimate mora. The suffix "yoo/karoo" introduces a new accent which always overrides the pre-existing one:

Accented stems:

38) accented adjective stem + karoo

taka "high" + karoo * *	"it is high, isn't it"
takakaroo * *	suffixation of "karoo"

```
takakaroo                    H Tone Insertion
 *     *
       |
       H

takakaroo                    H Tone Spread
 |   \||                     Default L Insertion
 L     H L
```

39) accented verb stem + yoo

```
tabe "eat" + yoo             "let's eat?"
 *           *

tabeyoo                      suffixation of "yoo"
 *   *

tabeyoo                      H Tone Insertion
 *   *
     |
     H

tabeyoo                      H Tone Spread
 |  \||                      Default L Insertion
 L   HL
```

Unaccented stems:

40) unaccented adjective stem + karoo

```
oisi "tasty" + karoo         "it is tasty, isn't it?"
               *

oisikaroo                    suffixation of "karoo"
       *

oisikaroo                    H Tone Insertion
       *
       |
       H

oisikaroo                    H Tone Spread
|  \\\||                     Default L Insertion
L     H L
```

41) unaccented verb stem + yoo

```
ire "put" + yoo          "let's put __?"
      *

ireyoo                   suffixation of "yoo"
   *

ireyoo                   H Tone Insertion
   *
   |
   H

ireyoo                   H Tone Spread
| \||                    Default L Insertion
L  HL
```

Although the stem is underlyingly accented, its accent is not marked as a head at the level of line 1, because it is invisible to stress processes after the cyclic suffix "yoo" is added:

42)

```
line 2          *              *              *
line 1     (    *  *)   (      *  *)    (    *  *)
line Ø     (*  * *)(*)   (*  *  *)(*)    (* * *)(*)
           ta be yo o     a ru ko o       ire yo o
            ^   ^          ^  ^             ^
```

The General Stress Rule applies on the stress plane introduced by the accented suffix "yoo", to generate the same stress pattern for accented and unaccented stems.

b. Noun clitics

Two nominal clitics fall into the category of dominant-accented suffixes. "Gurai" ('to the extent of') and "o" (honorific). The high tone always appears on the same mora regardless of whether the stem is accented or unaccented. (Underlying accents are indicated by asterisks, the locus of H Tone Insertion by a linked H.)

43)

```
makura          kokoro          atama          sakana
 *               *               *

makura gurai    kokoro gurai    atama gurai    sakana gurai
 *     *         *     *         *  *           *
       |               |            |           |
       H               H            H           H
```

o makura	o kokoro	o atama	o sakana
*	| *	| *	|
|	H	H	H
H			

Both clitics introduce a new acent to the domain: "gurai" on the first mora of the clitic, and "o" on the first mora following the clitic. "O" provides an instance of post-accentuation. Just as with "yoo/karoo" the accent introduced by the affixes overrides any other accent in the domain, and the General Stress Rule recognizes only the accent introduced by the clitic.

The prefix "o" lends support for the view that dominant suffixes are cyclic in the Halle and Vergnaud sense. "Yoo/karoo", "gurai" and "o" belong in the same class. They all impose a new accent that takes precedence over previously existing accents. The suffixes, "yoo/karoo" and "gurai", however, introduce an accent on the right, while the prefix "o" introduces its accent on the left. No principle accentuating the leftmost or rightmost diacritic could unify these cases. It is the fact that the accent is associated with a cyclic suffix that makes it the prominent one, not whether it is leftmost or rightmost in the domain.

2.5.2 Dominant-Shifting Suffixes

There remains one class of suffixes to consider. These are the dominant-shifting suffixes, so called because they neutralize some stress information on the stem, and they appear to shift accent across a word. This type of suffix is found only in the predicate morphology. None of the noun clitics dicscussed here fall into this class.

When one of these suffixes is affixed to an unaccented stem, the new form receives its high tone on the final mora -- a familiar pattern:

44)

ire azu	"put" + neg
irezu	segmental rules
irezu | H	H Tone Insertion
irezu | \\ L H	High Tone Spread, Default Low Insertion

However, when a dominant-shifting suffix is affixed to an accented stem, the accent on the new form shows up on the penultimate or the final mora, in all but one instance. This is true regardless of whether the accent is on the

first or last mora of the stem. The negative suffix "azu" is an example:

45)

```
aruk azu     "without walking"
  *

arukazu                          segmental rules
    *

arukazu                          H Tone Insertion
    *
    |
    H

arukazu                          H Tone Spread
| \| |                           Default Low Insertion
L  H L
```

46)

```
tabe azu  "without eating"
 *

tabezu                           input to tone rules
   *

tabezu                           H Tone Insertion
   *
   |
   H

tabezu                           H Tone Spread
 | | |                           Default Low Insertion
 L H L
```

The dominant-shifting suffixes are underlyingly accented but they lose their accent when attached to an unaccented stem. There is a kind of accent-harmony at work here:

47) Asterisk deletion

```
...M... —> ...M / where M is a mora in a dominant-
   *               shifting suffix that is attached to
                   an unaccented stem
```

3. Outline of the Predicate Morphology

3.1 Suffixes Investigated

Only five nominal clitics are discussed in this paper ("ga", "made", "shika", "gurai" and "o") and their distributional properties are straightforward. In this section the distributional patterns of the more complex predicate morphology are addressed. Almost all verbal and adjectival morphology is carried out through suffixation. The following suffix morphemes were investigated. A morpheme is taken here to be the smallest unit above the phonemic level that can be independently added to the verb or adjective stem.[5]

48)

Suffix	Function
te/kute	gerund
ku	adverbial
ru	verbal non-past
i	adjective non-past
ro/e	imperative
ana	negative (common form)
azu	negative (adverbial)
rare/re	potential
rare	passive
sase	causative
imas	formal
ita	volitional
oo	polite adjectival adverbial[6]

---

5. This data is taken from the appendix to Jorden Beginning Japanese, and from an essay by Kazue Akinaga in the appendix to Nihongo Hatsuon Akusento Jiten (Dictionary of Japanese Pronunciation and Accent). Forms with all nineteen of the suffixes investigated are listed in Jorden, and with thirteen of the suffixes are listed in Akinaga. Out of the overlap in data, both sources agree on all but three forms: "ro", "re" and "yoo". For these forms the data is taken from Akinaga. According to the Akinaga data, as opposed to the Jorden data, the allomorphs "re" and "kere", and the allomorphs "yoo" and "karoo" belong respectively to the same tone classes. The morpheme "re" is actually variable. In most of the forms it is listed with in Akusento Jiten it does not effect a shift in tone, but in a few instances it does.

6. This suffix is actually two vowel slots specified only as [+round, +back]. The plus or minus high features are supplied by vowel harmony which is triggered by the final vowel of the adjective stem to which the suffix is added. All adjective stems end in the vowels a, i, u, or o. For example: "taka-" (high), + "oo" —> "takoo". "oisii-", (tasty), +"oo" —> "oisyuu".

yoo/karoo	tentative
ta/katta	past
re/kere	pre-provisional
ba	provisional
ra	conditional
ri	representative

Nominal Clitics

o-	honorific
-gurai	"to the extent of"
-ga	nominative case marker
-made	"until"
-shika	"only"

The imperative ro/e and the potential rare/re have alternate forms, depending on whether the stem ends in a vowel or a consonant. The tentative, the past, the pre-provisional and the gerund have different allomorphs for verb and adjective stems. Although "kute" appears as if it could be a concatenation of "ku" and "te", it is not analyzed as such. The tonal behavior of "kute" puts it in a natural class with the other adjectival allomorphs beginning with kV(C).

3.1.1 New verb stem formation

There are several morphemes which make new verb stems. One of these is the formal ending "-imas", a dominant-accented suffix, like "yoo/karoo". The others are the causative, potential, and passive suffixes, "sase", "rare" and "rare", which are dominant-shifting suffixes like those discussed in section 2.1.

The suffix "-imas" makes a simple or informal verb stem into a formal verb stem. The new verb is accented, with the underlying accent on the final mora. "-Imas" occurs only after a verb stem, or after "sase", "rare" or "sase-rare". These formal verbs can take the suffixes below, which then exhibit the same tonal behavior that they show with informal verbs.[7]

49)
-imas.ru
-imas.te
-imas.ta
-imas.ta.ra
-imas.ta.ri
-imas.yoo
-imas.e

This suffix is referred to as "oo" in the rest of the paper.

7. The negative formal verb ending is idiosyncratic: "tabe.imas.en."

New verb stems can be formed by adding the potential ("rare/re"), passive ("rare"),[8] and causative ("sase") suffixes as in the chart below. These become verbs that can then be inflected like any other verb:

50)

Old stem + suffix = new stem		New meaning
tabe.rare-	"eat" + potential	"be able to eat"
tabe.rare-	"eat" + passive	"be eaten"
tabe.sase-	"eat" + causative	"to make eat"
tabe.sase.rare-	"eat" + passive-causative	"to be made to eat"

These suffixes belong to the class of dominant-shifting suffixes. The causative "sase" illustrates this below. The past suffix "-ta" is recessive, so it is tonally passive in the following example.[9]

51)

aruk sase ta "was made to walk"
* *

[arukase] ta — suffixation of "sase"
* *

[arukaseta] — General Stress Rule (cyclic application)
* * — H Tone Insertion
| — suffixation of "ta"
H

arukaseta — H Tone Spread
| ↘ | — Default L Insertion
L H L

52)

tabe sase ta "was made to eat"
* *

---

8. The potential "rare" and the passive "rare" differ in that the potential has two allomorphs, depending on whether the stem ends in a vowel or a consonant.

9. These forms are not listed in Jorden or Akinaga. This data is from a cooperative speaker of Tokyo Japanese.
(9.a There is disagreement among speakers about the placement of this accent. Some prefer to accent the first syllable: sase*)

```
[tabesase] ta          suffixation of "sase"
  *     *

[tabesaseta]           General Stress Rule (cyclic application)
  *     *              H Tone Insertion
        |              suffixation of "ta"
        H

tabesaseta             H Tone Spread
 |   \  |  |           Default L Insertion
 L     H L
```

53)

```
ire sase ta    "was made to put"
       *

[iresase] ta           suffixation of "sase"
                       asterisk deletion (47) applies

[iresaseta]            General Stress Rule
         |             H Tone Insertion
         H             suffixation of "ta"

iresaseta              H Tone Spread
|    \   |             Default L Insertion
L      H
```

3.1.2 Which suffixes belong to which tone classes

All the adjectival and verbal morphemes investigated fall into the three classes of tonal behavior described in Section 2. The suffix classes remain constant across stems, except when they are affixed to a handful of irregular verbs.

54)

Recessive[10]

te
ku
ta/katta
re/kere
ba

---

10. It is an interesting and unexplained fact that all recessive suffixes are unaccented.

ra
ri
oo
ro/e

Dominant-shifting

ru
i[11]
ana
azu
ro/e
oo
rare/re
rare
sase
ita

Dominant-accented

yoo/karoo
imas

3.2 Level Ordering

3.2.1 Verbs, adjectives and morpheme distribution

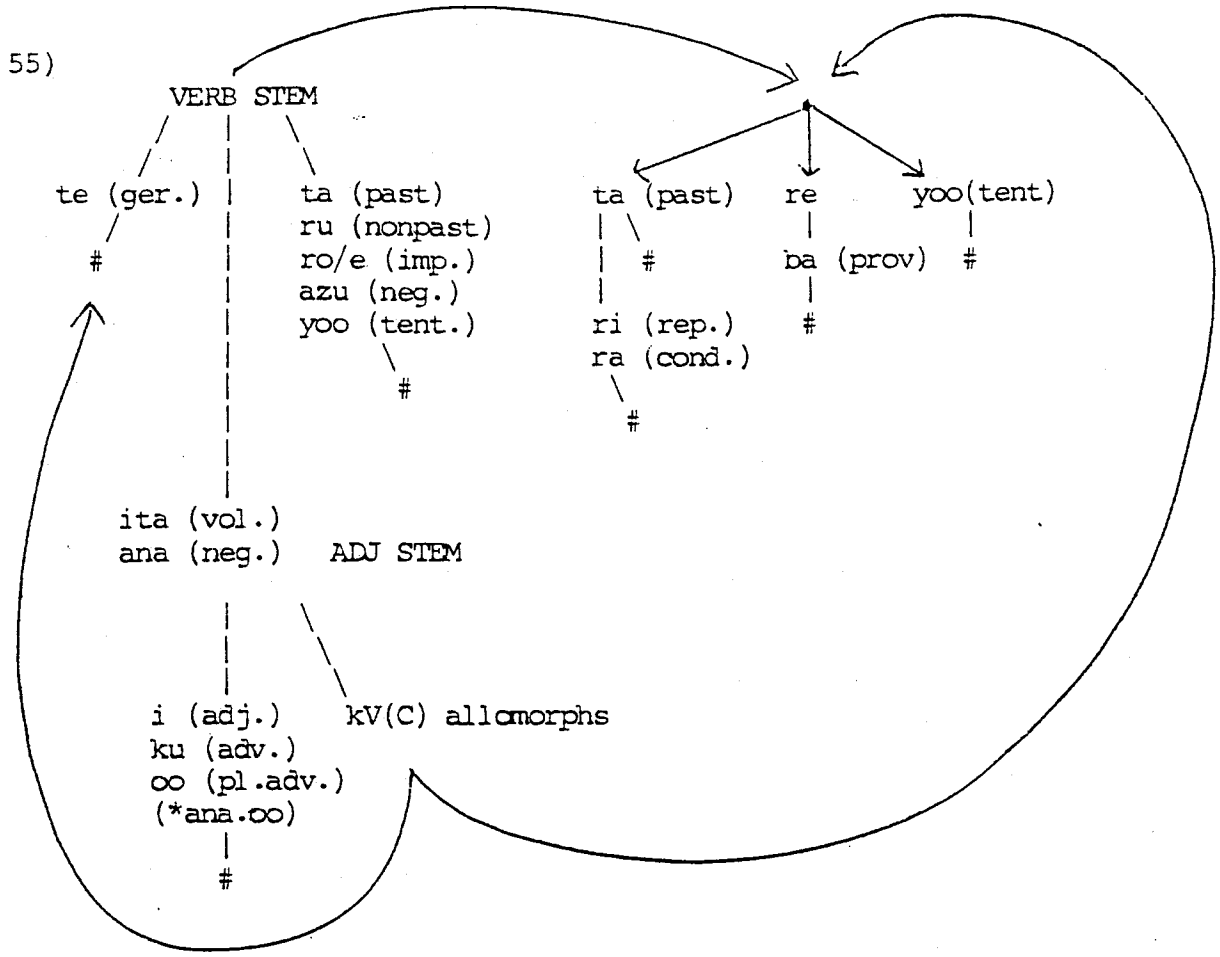
The flow chart below illustrates all the possible ways that verb and adjective stems can be concatenated with verbal and adjectival suffixes. Each route defined by lines traveling from a stem to #, with one suffix from each group on the route, is a possible form. New stem formation is omitted from the chart. Note that "ita" and "ana" in effect change a verbal into an

---

11. The suffix "i" is variable. It affects accent, as do the dominant suffixes, when it follows an adjective stem, but it does not affect tone when it follows the negative suffix "ana". It has been classed here as an independent dominant suffix, although the evidence for it is scanty. There is good reason to say that the "i" that follows pure adjective stems and the "i" that follows a verb stem + "ana" or "ita" are the same morpheme. "Verb + ita.i" and "verb + ana.i" have been called adjectival forms in some traditional grammars. They are similar in distribution because they affix to a natural class of apparently adjectival stems.

adjectival stem.

55)



The sweeping arrows represent single suffixes formed by allomorphy rules. All begin with a segment "kV(C)" that allows an adjective stem to bear a verbal suffix. "Kute" is included in this class, because it is an allomorph of "te", rather than a concatenation of "ku" and "te".

56)

takakute	"being high"
taka + te ——> takakute	"high" + gerund
*taka + ku + te ——> takakute	"high" + adverbial + gerund

3.2.2 Level ordering

The dominant and recessive morphemes fall into two distinct levels of morphology. The dominant suffixes may precede the recessive suffixes, but the recessive suffixes may not precede the dominant morphemes. This is illustrated in the list below, where all possible concatenations of these morphemes are shown. "S" represents suffixes that we argue are affixed in the syntax. 'R' means recessive, and 'D' means dominant suffixes.

57)

Single suffix

Suffix	Stem	Function	Tone Classes
-te	Vb	verbal gerund	R
-kute	Adj	adjectival gerund	R
-ku	Adj	adjectival adverbial	R
-ru	Vb	verbal non-past	D
-i	Adj	adjectival non-past	D
-ro/e	Vb	verbal imperative	R
-azu	Vb	verbal negative adverbial	D
-oo	Adj	polite adverbial adjective	R
-yoo	Vb	verbal tentative	D
-karoo	Adj	adjectival tentative	D
-ta	Vb	verbal past	R
-katta	Adj	adjectival past	R

Complex suffixes

-re.ba[12]	Vb	verbal provisional	
-kere.ba	Adj	adjectival provisional	R.S
-ta.ra	Vb	verbal conditional	R.S
-katta.ra	Adj	adjectival conditional	R.S
-ta.ri	Vb	verbal representative	R.S
-katta.ri	Adj	adjectival representative	R.S
-ana.i	Vb	verbal negative non-past	D.D
-ana.ku	Vb	verbal negative adverbial	D.R
-ana.kute	Vb	verbal negative gerund	D.R
-ana.karoo	Vb	verbal negative tentative	D.D
-ana.katta	Vb	verbal negative past	D.R
-ana.kere.ba	Vb	verbal negative provisional	D.R.S
-ana.katta.ra	Vb	verbal negative conditional	D.R.S
-ana.katta.ri	Vb	verbal negative representive	D.R.S
-ku.ana...	Adj	negative ...	R.D
-ita.i	Vb	verbal volitional	D.D
-ita.ku	Vb	verbal volitional adverbial	D.R
-ita.kute	Vb	verbal volitional gerund	D.R
-ita.karoo	Vb	verbal volitional tentative	D.D
-ita.katta	Vb	verbal volitional past	D.R

---

12. Although "re" never occurs without "ba", treatment of "ba" as an independent morpheme is supported by the fact that the provisional form of the copula verb, "desu", is "nara.ba".

-ita.kere.ba	Vb	verbal volitional provisional	D.R.S
-ita.katta.ra	Vb	verbal volitional conditional	D.R.S
-ita.katta.ri	Vb	verbal volitional representative	D.R.S
-imas.ru.te	Vb	verbal formal gerund	D.D.R
-imas.ru.ta	Vb	verbal formal past	D.D.R
-imas.ru.yoo	Vb	verbal formal tentative	D.D.D
-imas.ru.ta.ra	Vb	verbal formal conditional	D.D.R.S
-imas.ru.ta.ri	Vb	verbal formal representative	D.D.R.S
-rare.ru//re.ru	Vb	verbal potential non-past	D.D
-rare.ru	Vb	verbal passive non-past	D.D
-sase.ru	Vb	verbal causative non-past	D.D
-sase.rare.ru	Vb	verbal passive causative non-past	D.D.D

When the possible concatenations of morphemes are examined, it becomes apparent that recessive morphemes occur only at the end of a word, or before other recessive morphemes; while dominant morphemes can occur before recessive morphemes or at the end of the word. This suggests that two levels exist here; with the tonally active dominant morphemes affixed in the first level, and the more quiescent recessive morphemes affixed in the second. Note that while the existence of these cyclic and non-cyclic levels in Japanese morphology raises interesting questions about morphological models, they could be consistent with a variety of models: the lexical phonological model developed by Kiparsky(1983) Mohanan(1982) and others, as well as newer views of morphology proposed by Baker(1985) and Sproat(1985).

3.2.3 Downstepping

The astute reader will have noticed that there is one exception to the level ordering discussed in Section 3.2.2. This exception, however, occurs in conjunction with the phenomenon of downstepping, which actually supports the conclusion that recessive suffixes must follow dominant ones in this system.

The single instance of a dominant suffix following a recessive suffix among the complex suffixes listed above is "-ku.ana...". When "ana" follows "ku", a new level of phonology is introduced, indicated by the appearance of downstepping. The ordering of dominant inside recessive is within each level. "Ku" marks the end of one phonological domain and "na" marks the beginning of the next.

The first part of the form ("...ku-") surfaces exactly as it would without anything following it. The second part ("-na...") surfaces with a downstepped high tone following accented stems, and a continued high tone folowing unaccented ones. "Ita" is a dominant suffix and "ku" is a recessive suffix.

58)

accented stem:

tabe "eat" + ita + ku	anai[13]	"doesn't want to eat"
* *	*	
tabetaku anai		affixation of "ita" and "ku"
* * *		segmental rules
tabetaku anai		General Stress Rule
* * *		(cyclic application)
| |		H Tone Insertion
H H		
tabetaku anai		H Tone Spread
| ⟍ | | ||		Default L Insertion
L H L L H L		
tabetaku!nai		merger of domains
| ⟍ | ||		segmental rules
L H L HL		Downstepping

59)

unaccented stem:

ire "put" + ita + ku	anai	"doesn't want to put"
	*	
iretaku anai		affixation of "ita" and "ku"
*		segmental rules
iretaku anai		General Stress Rule
| *		H Tone Insertion
H |		
H		
iretaku anai		H Tone Spread
| ⟍ ||		Default L Insertion
L H HL		
iretakunai		merger of domains.

---

13. See footnote 11 regarding affixation of "ana" and "i".

| ↘ ||
L H HL

segmental rules.
no tone changes across boundary between domains.

Note that while there is downstepping with an accented stem, there is no downstepping with the unaccented stem. The presence of the intervening low in the accented example is responsible for the downstepping.

The phonological boundary marked by downstepping is also a syntactic boundary, as the topic marker "wa", in its contrastive use, can be inserted here under certain discourse conditions:

60)

tabetaku!nai "doesn't want to eat"

tabetaku-wa-nai "doesn't want to eat (but may want to do something else)"

4. Against a Tonal Account

A metrical account following the theory of Halle and Vergnaud, has been proposed above for Japanese stress and tone. Certain properties of this system are compatible with a metrical account. In particular, the distribution of underlying stress in accented verbs, and the association of high tone in accented and unaccented domains translate straightforwardly into metrical stress rules. Furthermore, in Japanese, each tonal domain must have one and only one high tone associated with it, a property that follows naturally from a metrical account.

An interesting account of Japanese accent has been proposed by Archangeli and Pulleyblank (1983) in which tone in the Japanese nominal system is treated as a strictly tonal, non-metrical phenomenon. Several ideas in the metrical analysis presented in this paper have come from Archangeli and Pulleyblank's tonal analysis. The underlying association of high tones, and the post-lexical rules of High Tone Spread and Default Low Insertion are drawn from this work. In this section I will compare the two approaches.

1) One of the attractive features of the Archangeli and Pullleyblank analysis is that high tones are associated underlyingly with roots and morphemes. No accent diacritics are employed. Accented nouns are easily analyzed in this way, since their tones may be placed on any mora in the word. But with verb stems the underlying accent or tone falls on the last closed syllable, or if there is none, on the first mora. This pattern, familiar from metrical stress systems, would be a difficult one to capture using only the non-metrical tools of tone rules. Whether it is tone or accent diacritics that are underlyingly associated with the verb stem, the locus of the association depends on syllable structure, rather than on the configuration of tones on an autosegmental plane, to which the rules would refer.

2) In Japanese there is always one and only one prominent tone per domain. When a new tone is introduced by the morphology into a domain, one tone is selected to be the dominant one. This is neatly expressed by the hierarchical action of metrical rules, but in a purely tonal account, it must be handled by rules inserting and deleting tones and association lines. In the Archangeli and Pulleyblank system a rule of High Tone Insertion on the final mora (H Insertion) and High Tone Deletion at the rightmost mora (H Deletion) accomplish this purpose:

61)

H Insertion: $V \longrightarrow \overset{|}{V}\ /\ ___]$ [14]
H

H Deletion: $H \longrightarrow \emptyset\ /\ H\ ___$

These rules derive the familiar pattern: The high tone surfaces on the underlyingly marked syllable first; and if there is none, on the final mora. When they are applied to an unaccented stem, they have the awkward consequence that a tone must be inserted and immediately deleted to derive the correct pattern:

62)

kokoro "spirit"
|
H

kokoro H Insertion
| |
H H

kokoro H Deletion
|
H

A rule system that places a tone on a word and immediately removes it, for all unaccented words in the language, should be suspect. A lot of machinery is set to work to accomplish little. The two rules of H Insertion and H Deletion might be one rule, in which case we are reduced to a one step assessment of the tonal domain. Building a left-headed constitutent on level one of the grid accomplishes just this.

3) The rules of H Insertion and H Deletion are functionally equivalent to the General Stress Rule, in that they select the leftmost tone of the domain. These rules handle lone stems and stems followed by recessive

---

14. Vowels (V) instead of mora are used in Archangeli and Pulleyblank, to represent tone-bearing units.

affixes. They are inadequate to deal with cyclic-accented affixes like "gurai" and "o", where the new tone introduced is the one that takes precedence over any pre-existing tone on the stem. The new tone introduced by the affix is on the right in the case of suffixes, and on the left with prefixes. The "gurai" type of suffixes and the "o" type of prefixes cannot be unified under the Archangeli and Pulleyblank approach. Some version of cyclicity compatible with a tonal analysis is necessary to account for these forms. Without that, Archangeli and Pulleyblank are forced to mark "gurai" as exceptionally excused from the rule of H Deletion.

4) The cyclic-shifting suffixes are the most puzzling class of suffixes under any approach — metrical or tonal — as they are something of a hybrid of the other two suffix classes. They do however, present particular problems in a tonal analysis.

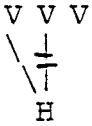
In the Archangeli and Pulleyblank analysis, there are no accented verbs. Instead of being supplied with a pre-linked high tone, like the accented nouns, this class of verbs triggers two rules: i) a rule of extratonality that makes the final mora of the morphological domain extratonal:

63)
Verb Extratonality: $\longrightarrow$ [+ex] / $\underset{Vx}{___]}$

where Vx is the class of "accented" verbs

and ii) a rule of high tone delinking, that applies after H Spread to delink a tone from the penultimate mora, when the verb is followed by a recessive suffix like "ta":

64)
H Delinking:



A derivation according to these rules runs as follows:

65)

tabe ta	Verb stem "eat" + past
tabe(ta)	Verb Extratonality
tabe(ta) | H	H Insertion
tabe(ta) \ H	H Spread

```
tabe(ta)        H Delinking
 |
 H
```

The rule of H Delinking is clearly unsatisfactory. Besides the fact that it depends on a lexical marking of rules to explain what can be explained in a metrical account through rules that apply generally, it makes the wrong predictions with unaccented verbs with stems more than two morae long:

66)

```
correct form:      shi.n.ji.ta      "believe" + past
                     |
                     H

incorrect form:  *shi.n.ji.ta
                       |
                       H
```

I have shown that in either a tonal or a metrical system, the class of so-called "accented" verbs must bear underlying accent or prelinked tone. If verbs have prelinked tones, then a tonal analysis runs up against the same problem with the dominant-shifting suffixes as with the dominant-accented suffixes like "gurai":

67)

```
tabe ru      "eat" + present/future
 |
 H

tabe(ru)     Verb Extratonality
 |
 H

tabe(ru)     High Insertion
 | |
 H H

tabe(ru)     High Deletion
 |
 H

*tabe(ru)    incorrect output
 |
 H

taberu       correct output
   |
   H
```

To handle these forms, some version of cyclicity as well as prelinked tones in the class of "accented" verbs are necessary. Neither a tonal nor a metrical analysis can handle these cases without cyclicity.

The rule of Verb Extratonality proposed by Archangeli and Pulleyblank is triggered by the class of accented verbs rather than by the class of suffixes. This cannot be correct because then the forms consisting of an unaccented verb stem following a dominant-accented suffix cannot be predicted:

68)

ire yoo | H	"put" + tentative
ireyoo | H	Verb Extratonality not applicable for unaccented stems
ireyoo || HH	H Insertion
*ireyoo || HH	incorrect output

The distinction between accented and unaccented verb stems expressed by the rule of Verb Extratonality applies to verbs followed by dominant-shifting suffixes only. It does not apply when the suffix is dominant-accented. [15]

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15. Before we leave the topic of these dominant-shifting suffixes it must be pointed out that neither the metrical nor the tonal approach discussed in the paper can handle these suffixes without some version of an allomorpy rule. In the metrical analysis, the cyclic-shifting suffixes have an accent that is lost when they are affixed to an accented stem. From the tonal view, these suffixes become extratonal when they follow an "accented" stem.

In both styles of analysis, the phenomenon can be handled by marking the suffix as aquiring either extratonality or an inherent accent. The extratonality account and the accent account are not functionally very different. But a third treatment suggests iteslf, (expressed by the name of these suffixes): There is a rule of accent- or tone-shift that applies only when there is an accent or tone present; i.e., it applies only to accented words. In spite of the difficulties of formalizing such a rule, it has attractive possibilities. If a larger corpus of data should reveal a reason for choosing the shifting analysis over the extratonality or inherent-accent analysis, such a shifting rule would look more like a metrical phenomenon

6) I have shown in 4.3 and 4.4 that in a tonal analysis of Japanese: i) there must be a class of verbs with prelinked tone or accent, ii) some version of cyclicity must be invoked, and iii) the properties of extratonality or inherent accent that show up on certain suffixes must be associated with the suffixes themselves, rather than with the stem class. These three conditions are not incompatible with a tonal analysis. However, in sections 4.1 and 4.2 I have illustrated how a metrical analysis is superior to a purely tonal one. A metrical analysis of Tokyo Japanese incorporating the idea of cyclicity provides the greatest coverage of the data among the approaches discussed here, and does it by involving the least amount of awkward machinery.[16]

Summary

This paper has demonstrated that the facts of tone in Tokyo Japanese are best captured in a metrical account. A General Stress Rule of a metrical nature applies to all domains -- verbal, adjectival, and nominal -- and to cyclic and non-cyclic suffixes, but does not apply to underived stems before the affixational morphology. Some metrical organization is apparent in the narrower domain of verbs, in the way that stress is assigned within accented verb stems. Three types of suffixes occur in the morphology: there are one class of recessive or non-cyclic suffixes, and two classes of dominant or cyclic suffixes. These are distinguished because the affixation of cyclic suffixes causes some accentual information on the stem to be obliterated, while recessive suffixes do not have such an effect. Furthermore, these suffix classes are distributed within rigorous ordering constraints. Recessive suffixes may not occur closer to the stem than dominant ones. In fact, in the one instance where a recessive suffix appears inside a dominant suffix, the dominant suffix marks a new phonological and syntactic domain, and downstepping occurs. Finally, phonological boundaries have been shown to coincide in interesting ways with syntactic ones in at least two instances: (i) the downsteppng just mentioned marks a level of optional topic-marker insertion; and (ii) a boundary between COMP and INFL is preserved in the phonological system. This is interesting because in both cases the phonological and syntactic boundaries are not clear word boundaries. In brief, this paper demonstrates how the interaction of metrical tone with cyclicity produces the complex tonal patterns of Tokyo Japanese.

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than a strictly tonal one, since it shifts accent across an unbounded distance.

16. In Japanese there is a phenomenon whereby high vowels may become devoiced under certain conditions. When this happens to a high vowel that bears tone, the tone is shifted to a neighboring mora because voiceless vowels do not bear tone. The tone-shifting patterns resulting from high-vowel devoicing have been cited as evidence for a metrical analysis by Halle(1982). Archangeli and Pulleyblank show that the same effects follow naturally from a tonal analysis. Since, in the opinion of this author, the tone-shifting that results from high-vowel devoicing can be equally satisfactorilly handled under either approach, the phenomenon has not been discussed in this paper.

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Archangeli, D. and Pulleyblank, D. (1983), "Extratonality and Japanese Accents", (unpublished).

Baker, M. (1985), "The Mirror Principle and Morphosyntactic Explanation". Linguistic Inquiry, 16.3.

Baker, M. (1985), "Incorporation: A Theory of Grammatical Function Changing", Doctoral Dissertation, MIT, Cambridge, MA.

Halle, M. "Remarks on Metrical Theory," presented at GLOW, Paris.

Halle, M. and Mohanan, K.P. (1984), "Segmental Phonology of Modern English", Linguistic Inquiry, 16.1.

Halle, M. and Vergnaud (1986), unpublished manuscript, "An Essay on Stress".

Haraguchi, S. (1977) The Tone Pattern of Japanese: An Autosegmental Theory of Tonality, Kaitakusha: Tokyo.

Hayes, B. (1980), "A Metrical Theory of Stress Rules", Doctoral Dissertation, MIT, Cambridge, MA.

Jorden, E.H. (1972) Beginning Japanese Part 2, Yale University Press: New Haven and London.

Kiparsky, P. (1983) "Lexical Phonology and Morphology", in S.I. Yang (ed.) Linguistics in the Morning Calm, 3-9, Hansin:Seoul.

Mohanan, K.P. (1982), "Lexical Phonology", Doctoral Dissertation, MIT, Cambridge, MA

Nihongo Hatsuon Akusento Jiten (1966), Nihon Hoosoo Kyookai, Nihon Hoosoo Shuppan Gaisha: Tokyo.

Pierrehumbert, J. and Beckman, M. (1986) "Japanese Tone Structure", unpublished manuscript, Bell Laboratories, Murray Hill , N.J.

Prince, A. (1983), "Relating to the Grid", Linguistic Inquiry 14.1, pp. 19-100.

Pulleyblank, D. (1983), "Tone in Lexical Phonology", Doctoral Dissertation, MIT, Cambridge, MA.

Sproat, R. (1985), "On Deriving the Lexicon", Doctoral Dissertation, MIT, Cambridge, MA.